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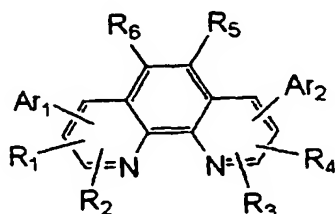
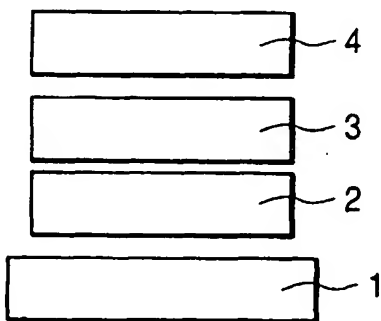
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[Continued on next page]

(54) Title: PHENANTHROLINE COMPOUND AND ORGANIC LIGHT EMITTING DEVICE USING SAME



(I)

(57) Abstract: A novel phenanthroline compound is provided which is represented by the general formula [I]: (wherein R¹#191, R²#191, R³#191, R⁴#191, R⁵#191 and R⁶#191 are the same or different and each is selected from a hydrogen atom, an unsubstituted or substituted alkyl group, an unsubstituted or substituted aralkyl group, an unsubstituted or substituted aryl group, an unsubstituted or substituted heterocyclic group, and a halogen atom, and Ar¹#191 and Ar²#191 are the same or different and each is selected from an unsubstituted or substituted fluorenyl group, an unsubstituted or substituted fluoranthenyl group, an unsubstituted or substituted perylenyl group, and an unsubstituted or substituted carbazolyl group). An organic light emitting device using the phenanthroline compound is also provided that has a light output with a high efficiency and a high luminance and has a high long-term durability.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP03/11485

Box I Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See the attached paper.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP03/11485

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl⁷ C07D471/04, C09K11/06, H05B33/14, H05B33/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl⁷ C07D471/04, C09K11/06, H05B33/14, H05B33/22

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Japanese Utility Model Gazette 1926-1996, Japanese Publication of Unexamined Utility Model Applications 1971-2001, Japanese Registered Utility Model Gazette 1994-2001, Japanese Gazette Containing the Utility Model 1996-2001

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CAOLD (STN), CAPLUS (STN), REGISTRY (STN)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	EP 1097980 A2 (SONY CORPORATION) 2001.05.09, page 30-31 & EP 1097980 A3 & JP 2001-131174 A	1, 16, 19 2-15, 17, 18
X Y	EP 1097981 A2 (SONY CORPORATION) 2001.05.09, page 4, page 29-30 & EP 1097981 A3 & JP 2001-135482 A & US 6524728 A	1, 2, 16, 17, 19 3-15, 18
Y	JP 2001-267080 A (TORAY INDUSTRIES, INC.) 2001.09.28, page 5-6, page 8 (Family: none)	1-19
Y	ITO, T., "Synthesis of phenanthroline derivatives and their application to organic EL devices" Polymer Preprints, Japan, (2002.09.18), VOL.51, NO.11, pp.2859-2860	1-19
Y	JP 2002-050481 A (TORAY INDUSTRIES, INC.) 2002.02.15, page 4 (Family: none)	1-19

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/JP03/11485

The invention is composed of the following 4 groups;
phenanthroline compounds substituted fliorennyl group (claims 1-6,16-19),
phenanthroline compounds substituted flioranthenyl group (claims 1-3,7-9,16-19),
phenanthroline compounds substituted perylenyl group (claims 1-3,10-12,16-19),
and phenanthroline compounds substituted carbazolyl group (claims 1-3,13-19).

Claims 1-19 have the phenanthroline moiety useful for an organic light emitting device in common, however, it does not appear to be novel, as it is disclosed in D1-4 (D1: EP 1097980 A2, D2: EP 1097981 A2, D3: JP 2001-267080 A, D4: Polymer Preprints, Japan, (2002.09.18), VOL.51, NO.11, pp.2859-2860). In other words, the common moiety above-mentioned is within the reach of prior art, and it is not considered as "special technical features".

Consequently, there is no technical relationship among those inventions involving one or more of the same or corresponding technical features. Therefore, these groups of invention are not linked so as to form a single general inventive concept.